WHAT IS CLAIMED IS:

1. A building monitoring system utilizing bi-directional radio frequency communication comprising:

at least one master unit including a radio frequency transmitter and receiver;

a plurality of remote units having a radio frequency transmitter and receiver, said remote units capable of transmitting to and receiving from said master unit; and

said master unit includes a master scheduler that provides non-colliding predetermined communication times for each of said remote units, said remote units have a timer coupled to a controller for enabling said remote units to communicate at said predetermined communication times with said master unit.

2. A building monitoring system according to claim 1, wherein said remote units include:

a radio frequency transceiver capable of receiving from and transmitting to said master unit;

a controller coupled to said transceiver for controlling said transceiver; and

at least one sensor coupled to said controller.

3. A building monitoring system according to claim 2, wherein each of said remote units transmit a message to said master unit at a predetermined transmission time, said predetermined transmission time being determined by said master scheduler and transmitted to said corresponding remote unit, said scheduler coordinating each

predetermined transmission time so as to avoid collisions between predetermined transmissions times of other remote units.

4. A building monitoring system according to claim 3, wherein said predetermined transmission times are transmitted from said master unit to said remote units as absolute times.

5. A building monitoring system according to claim 3, wherein said predetermined transmission times are transmitted from said master unit to said remote units as time delays.

6. A building monitoring system according to claim 3, wherein said remote units have a target transmission period and an estimated transmission duration, said master unit spacing said predetermined transmission times by at least said estimated transmission durations to avoid collisions.

7. A building monitoring system according to claim 6, wherein said remote units have remote unit types and said estimated transmission durations depend on said remote unit type, said master schedule being calculated as a function of said estimated transmission durations.

8. A building monitoring system according to claim 1, wherein said remote units having a first low power consumption state in which said remote units can neither

receive nor transmit, a second power consumption state in which said units can receive, and a third power consumption state in which said units can transmit, said remote units are in said receive state only at predetermined intervals, wherein said second and third sates have higher power consumption than said first state, and wherein at least some of said remote units include sensors logically coupled to said remote units.

9. A bi-directional building monitoring system comprising:

at least one master unit including means for wireless transmission and reception of data;

a plurality of remote units, wherein each of said remote units include means for wireless transmission of data to said master unit and means for wireless reception of data from said master unit, said remote units further include means for sensing external conditions and generating external sensor data;

means for calculating a schedule of periodic transmissions from said remote units to said master unit;

wherein said means for transmitting from said master unit to said remote units includes means for transmitting at least part of said schedule to said remote units ; and

timing means in said remote units for enabling said remote unit to transmit said external sensor data to said master unit in accordance with said schedule.

10. A method for allowing a remote unit to communicate with a master unit in a building monitoring system that has at least one master unit including a radio frequency transmitter and receiver, and a plurality of remote units having a radio frequency

transmitter and receiver, said remote units capable of transmitting to and receiving messages from said master unit, the method comprising:

a. determining a remote unit communication time for each remote unit to communicate with said master unit such that each of said remote unit times do not collide with each other;

b. transmitting each remote unit communication time to a corresponding remote unit;

c. detecting when the remote unit communication time arrives for each remote unit; and

d. communication a message between a corresponding remote unit and said master unit when each remote unit communication time is detected.

11. A method according to claim 10, wherein each of said remote units have a non-communicating low power consumption state in which said remote units can neither receive nor transmit, a receiving state in which said units can receive, a transmitting state in which said units can transmit, said receiving and transmitting states having higher power consumption than said non-communicating state.

12. A method for scheduling remote unit radio frequency message transmissions in a building monitoring system, the method comprising:

a. providing at least one master unit including a radio frequency transceiver, and a controller for operating said transceiver;

b. providing a plurality of remote units, wherein said remote units include a radio frequency transceiver capable of transmitting to said master unit transceiver and capable of receiving from said master unit transceiver, wherein said remote units have a target transmission period;

c. providing means in said master unit for calculating a master schedule of predetermined remote unit transmission times for said remote units, wherein said predetermined remote unit transmission times are based at least in part on said remote unit target transmission periods, such that collisions are avoided between said predetermined transmissions;

d. calculating said master schedule of predetermined remote unit transmission times based at least in part on said remote unit target transmission periods;

e. transmitting timing instructions based on said master schedule from said master unit to said remote units; and

f. transmitting messages from said remote units to said master unit at times based on said timing instructions.

13. A method as recited in claim 12, wherein said means for calculating includes a computer executing a program allocating said predetermined transmissions times to a plurality of time slots for said remote unit predetermined transmission times, wherein said time slots are stored in said schedule.

14. A method as recited in claim 12, wherein said remote units have an estimated transmission duration, wherein said schedule of predetermined times insures

that, for each of said remote units, each of said predetermined remote unit transmission times have a start time wherein said start times are spaced apart by at least said remote unit estimated transmission durations.

15. A method as recited in claim 12, wherein said remote units have are classified into types and said estimated transmission durations are a function of said remote unit types, wherein said calculating schedule step includes determining said estimated transmission duration as a function of said type.

16. A method as recited in claim 12, wherein said remote units are classified into types and said remote unit target transmission periods are a function of said remote unit types, wherein said calculating schedule step includes determining said remote unit target transmission periods as a function of said type.

17. A method as recited in claim 12, wherein said remote units are coupled to sensors wherein said sensors are classified into types and said estimated transmission durations are a function of said sensor types, wherein said calculating schedule step includes determining said estimated transmission duration as a function of said sensor type.

18. A method as recited in claim 12, wherein said remote units are coupled to sensors wherein said sensors are classified into types and said remote unit target transmission periods are a function of said sensor types, wherein said calculating

schedule step includes determining said remote unit target transmission as a function of said type.

19. A method as recited in claim 12, wherein said means for calculating includes an executable computer program including the steps of,

deriving said remote unit target periods from data obtained from said remote units;

setting a maximum target period;

determining a maximum remote unit transmission duration;

dividing said maximum target period by said maximum target duration to obtain the number of elements to allocate;

create a data structure with at least said number of elements; and

beginning with one element, for each remote unit, filling a bucket having available time with a remote unit identifier, then skipping ahead about the time of the remote unite target period, and filling another element with said remote unit identifier, repeating until the maximum target period has been covered.

20. A method as recited in claim 19, wherein said maximum target period is the largest target period obtained from said remote units.

21. A method as recited in claim 19, wherein said maximum target period is the largest target period obtained from said remote units clamped at a maximum value.

22. A method as recited in claim 19, wherein said remote units are classified into types and said remote unit target periods are obtained indirectly from said remote units by obtaining said remote unit types from said remote units and said remote unit target periods are derived from said remote unit types.

23. A method for as recited in claim 19, wherein said means for calculating includes an executable computer program including:

obtaining said remote unit target periods from said remote units;

setting a global maximum target period;

for each remote unit, calculating the number of predetermined transmissions that will occur within the global maximum target period;

for all remote units together, calculating the global number of predetermined transmissions that will occur within the global maximum target period;

creating an ordered data structure having a number of elements at least equal to said global number of predetermined transmissions; and

for each remote unit, for each of said number of predetermined transmissions for said remote unit, filling in one of said elements in said data structure with data including an identifier for said remote unit and a predetermined time for that remote unit to next transmit.

24. A method as recited in claim 23, wherein said data structure includes a linked list of at least one element for each predetermined remote unit transmission time, wherein said linked list is sorted according to time of predetermined transmission.

25. A method as recited in claim 23, wherein each of said remote units has an estimated maximum remote unit transmission period, wherein an estimated end of transmission is calculated based at least in part on said predetermined transmission time and said estimated transmission duration, wherein and said data structure element contained predetermined next transmit time does not occur not before said estimate end of transmission time.

26. A method as recited in claim 23, wherein said computer program, in execution, traverses said elements of said data structure in time order, and for each element, transmits said next predetermined remote unit transmission time to said remote unit for said element.

27. A method for operating a bi-directional radio frequency building monitoring system master unit including at least one master unit having a controller coupled to a transceiver, and a plurality of remote units each having a transceiver, the master unit having a computer processor and a time ordered data structure including a plurality of elements, said data structure elements having predetermined transmission times including at least one predetermined transmission time for each of said remote units having predetermined transmission times, the method comprising the steps of said computer processor executing at least the following steps:

a. traversing said data structure, and, for each data structure element having at least one of said remote unit predetermined times;

b. waiting upon either a transmission from said remote unit associated with said data structure element or a timeout without receiving a transmission from said remote unit;

c. upon reception of said transmission from said remote unit, transmitting an acknowledgement of said received transmission and transmitting a time signal for next remote transmission, said time signal being consistent with said predetermined transmission time contained in said element, and advancing to said next time ordered data structure element and executing step b; and

d. upon timeout without receiving said transmission from said remote, advancing to said next time ordered data structure element and executing step b.

28. A method as recited in claim 27, wherein said time signal includes a time delay for said remote unit to wait until transmitting.

29. A method as recited in claim 27, wherein said time signal includes an absolute time at which said s remote unit is to transmit.

30. A method as recited in claim 27, wherein said time signal includes no time data which said remote unit interprets as an instruction to re-execute the current predetermined time.